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For U.S. Commission, New York World's Fair

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Contents

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Ideas: Architecture of Freedom. . . . .	3
Fundamental Ideas of Founding Fathers . . . . .	3
Traditions Which Influenced Them . . . . .	4
Documents Evolved From Their Thinking. . . . .	4
Conservation: Government's Steps in Agriculture. . .	7
Steps to Conserve Soil . . . . .	8
Steps to Conserve Water. . . . .	9
Steps to Conserve Forests. . . . .	10
Relationship to Wildlife . . . . .	11
Broad Concepts of Food Conservation. . . . .	11
The Arts: Agriculture's Contributions. . . . .	12
Science: Establishment of Research Concepts	
in Agriculture. . . . .	14
Activities of the Beltsville Center. . . . .	15
Research Touches Everyone. . . . .	17
Breadth of Agricultural Science. . . . .	18
Agricultural Education: Unique in the World. . . .	20
Human Resources: Agriculture's Development . . . .	21
Today's Farmer and His World . . . . .	22
The Changing Agriculture Is a Changing People. .	23
Agriculture's Broadened Environment. . . . .	25
Land and People: The Shape of Freedom . . . . .	26
Problems Resulting from Ideals. . . . .	27
Rural Welfare Creates City Welfare . . . . .	27
Nutritional Gap Knows No Boundaries. . . . .	28
Population Pressures Abolish Old Needs . . . . .	29
Conservation: Problems of Long-Term Interest . . .	29
Types of Reserves. . . . .	30
Determining Best Use of Land and Water . . . . .	31
Timber Developments--Bringing Up Potentials. . .	32
Closeness of Wildlife, Land, and Human	
Problems . . . . .	33
Little Fear of Resource Exhaustion Today . . . .	34
More Food Possible with Less Land. . . . .	34
Science as a Conservation Tool . . . . .	35
Education and Agriculture's Needs . . . . .	38
Agriculture Must Have More Scientists. . . . .	38
Enrollments Are Declining. . . . .	39
Problems in the Development of Human Resources. . .	39
Land and People Inseparable. . . . .	39
Need for More Government Assistance. . . . .	40
Solutions Will Benefit All America . . . . .	41
Many Programs Underway Already . . . . .	41



## Summary

Agriculture is the United States' biggest business. One out of our every 12 persons works on a farm or ranch. Add the people who market farm products, and you can account for nearly one job out of four. Add the people who produce farm supplies, such as fertilizer and machinery, and you account for nearly one job out of three in the United States.

These people supply the food, clothing, and other farm-derived commodities used by the 188 million people of our country. And the products of one out of every five harvested acres go overseas.

Today one U.S. farm worker grows enough food and fiber for 27 people. Just 100 years ago, one farmer did well to feed himself and five others. And then consumers could get only those products that happened to be in season or grown nearby.

Most of us today take agriculture's accomplishments for granted. They are in large measure a result of at least 10 decades of research, education, and several different types of technical, financial, and other services to farmers and ranchers and other land users, to the processors and marketers of farm and forest products, and most importantly, to the consumers of food, fiber, oils, and wood products.

These services are assured to all through the cooperative efforts of local, State, and national programs of the United States Department of Agriculture, known as the USDA. Benefits of this work extend into every supermarket and every housewife's kitchen. The duties of that work reach into many and varied aspects of daily living. They underpin industries, employment opportunities, and the life resources for future generations.

This is not to say that such accomplishments have come without problems. Problems have been varied and plentiful, and many of them are still with us. As



agriculture has expanded in its complexity with other economic groups, there have arisen new needs and new problems that affect not just agriculture but us all.

It has never been possible to rub a lamp and expect one single answer to our problems. Any agriculture progress must be measured in terms of people, not in terms of supply-and-demand economics alone. And people are varied. Thus any effort toward solution of problems these days must consider the traditions and resources of the land, the needs of both rural and urban people, our ever-broadening international ventures, plus an economic revitalization that will retain our country's strength.

That is our new vision and agriculture's "Challenge to Greatness."



## AGRICULTURE AND THE CHALLENGE TO GREATNESS

Agriculture today serves as the keystone of our thriving commerce and industry. The Nation's economic development is geared directly to the success or failure of its agriculture and forestry. The principal beneficiary is the U.S. citizen and consumer--every one of us, whether we live in town or country.

Industrial strength requires workers that are strong and vigorous and well-fed. Thanks to our constantly improving farm technology and efficiency on the farm, and our improved marketing system, American workers have food abundance at reasonable prices. They have more left of their wages and earnings than workers in other industrial nations and thus are able to enjoy a higher standard of living.

Because agriculture in the United States is efficient, more people have been released from the job of producing food. They handle the other types of work that contribute to national strength and well-being.

## IDEAS: ARCHITECTURE OF FREEDOM

American agriculture proves that democracy can produce excellence. It has shown a creativity never before experienced in history. It grew out of the political system that arose from the burning desire for liberty among American colonists who created the Declaration of Independence.

## FUNDAMENTAL IDEAS OF FOUNDING FATHERS

An important part of our political development was a new concept in education and the advancement of knowledge. American settlers on a new continent faced many problems never encountered by their forebears, most of them came from Europe.

Inspired through new information from learned societies abroad, early intellectuals founded the American Philosophical Society in 1743. Its early work dealt mostly with botanical subjects and scientific inquiries into ideas that could be put to work in agricultural practice. The Society became the first milepost of



scientific agriculture in America. It later sponsored the Philadelphia Society for the Promotion of Agriculture, formed in 1775 "to promote a greater increase of the product of the land within the American States."

### Traditions Which Influenced Them

Many similar societies arose. In his last message to Congress, President George Washington recognized the need for public support of agriculture to increase and improve it. This was a major public effort by Washington. He had already invested much of his own time and money to develop crops, improve tillage methods, and practice conservation on his own farms. He also had encouraged his contemporary colonial land owners to do the same. Washington has been credited by some with having actually operated the Nation's first experiment station, although Thomas Jefferson, Alexander Hamilton, and Patrick Henry also contributed both thought and action to the development of early U.S. agriculture.

In the pattern of the early societies, many county and State societies began during the early 1800's. They held meetings, usually in wintertime, and featured papers and talks intended to improve agriculture. Nationally, there was an interest in statistics on crop and livestock production, and the U.S. Patent Office began collecting statistics and distributing seeds in 1839. By the 1840's the public was growing aware of the need for agricultural colleges.

### Documents Evolved From Their Thinking

Thus the setting of problem-centered societies, existing in a political environment that guaranteed freedom of speech, led finally to the enactment by the Federal Congress of two acts. The first was the act of May 15, 1862. It established the United States Department of Agriculture. Often called the "Organic Act," it provides ". . . There shall be at the seat of government a Department of Agriculture, the general design and duties of which shall be to acquire and diffuse among the people of the United States useful information connected with agriculture in the most general and comprehensive sense of that word . . ."



On July 2, 1862, came enactment of the second Act, known as the Land-Grant College Act which provided a new basis for academic freedom. Previously most higher education, in the United States and abroad, was based on cultures that limited higher education to a relatively small "elite" segment of people. The Land-Grant Act specified that colleges established under it by the respective States should be for the "agricultural and mechanical" classes, in other words "people's universities." It also established a new relationship between the Federal Government and the States in the matter of education.

This Federal-State relationship was strengthened subsequently with passage of the Hatch Experiment Station Act of 1887. The Hatch Act enabled agriculture to serve as the pilot area for trying out the concept that knowledge must be sought as well as taught if civilization is to advance.

A breakthrough in research for all physical and biological sciences came with establishment of the nationwide system of agricultural experiment stations after the Hatch Act. Coupled with the later development of demonstration teaching, first recognized nationally under the Smith-Lever Act of 1914, which gave Federal support to cooperative extension work, the framework for the scientific revolution in agriculture was complete.

These formal moves by government advanced a broad variety of cooperative State and Federal services to meet the needs of farm people and the people of the United States, under the leadership of the Department of Agriculture. Earliest among these services were the scientific bureaus including those of animal industry, plant industry, chemistry, forestry, and soils. One of the earliest studies on marketing in the Department was on use of cooperatives for marketing cotton. Extension education programs early took on important roles in the Department's services to farmers and today provide similar services to urban people through programs of public affairs, consumer education, and youth development.



Response by the agricultural industry and the farm population to these programs has brought our agriculture to heights undreamed of by our founding fathers. True, an America moved into the 30's, prices of many commodities fell to unprecedented levels. Urged on by the people, a period of adjustment began, in which some programs met some needs while others became of only temporary value.

But in the past hundred years, the agricultural institution--the team of government, farming, processing, and marketing--has met every major need of Americans for food and fiber at home and abroad, in war and in peace. The United States is the world's largest exporter of agricultural products; in 1961 it supplied nearly 1/5 of the volume of farm products that entered world trade. Achievements of American agriculture offer goals sought by the rest of the world, both free and communist. Our agricultural efficiency and productivity and our ability to produce in abundance sustain millions of the world's underfed people in the struggle for freedom and economic growth.

As America itself became propelled into international events, so also did agriculture enter the arena. We have joined other countries to discuss mutual problems and ways to meet them. We have shared our technology to improve their agriculture and their well-being. We participate in programs to improve marketing agreements, trade, finance, and exchange on an international scale. Through welfare agencies--both private and governmental--American agriculture has made large quantities of food available to the hungry of the world under our Food for Peace program.

Each U.S. citizen benefits from inspection, grading, and Food and Drug regulation. When the American housewife visits the food store she is assured that the wholesomeness of our food is beyond doubt. And yet we spend only 1/5 of our take-home pay on food.

Every chicken, every turkey, every duck, goose, stewing hen, all beef, pork, and lamb moving in interstate commerce either processed or fresh is inspected for



wholesomeness by USDA inspectors. In addition much of our egg products, dairy products, and rabbits are Government inspected. Also about 80 percent of all turkeys, half of all beef, and much of our butter and eggs are graded by USDA graders. American consumers are also protected by regulations enforced by the Food and Drug Administration.

#### CONSERVATION--GOVERNMENT'S STEPS IN AGRICULTURE

A hundred years ago there was an average of about 60 acres of land for every man, woman, and child counted in the 1860 census. These acres included fertile valleys, virgin forests, rolling prairies, short grass plains, mountains and deserts. But already the original forests of the East had almost given way before axe, fire, and plow. Through the years, the prairie grasslands withered through overstocking and breaking the sod where the rainfall was too low. Erosion by water in the East was matched by wind and water erosion in the West. Floods--once our only water problem--increased as the land was cleared. Scarcity of water became serious first in the low rainfall areas of the West.

Our land problems have varied from one region to another, and in the past one pattern was common: a single resource approach to development, a one-way approach to problems, an exploitation of resources for immediate gain. In the Southeast, exploitation began more than 100 years ago when the cotton gin changed the way of life of the people.

Exploitation attitudes were natural among the early pioneers who settled on a new continent with plenty of land. Many of them were not interested in a permanent agriculture but, instead, valued wealth and freedom more highly among their separate goals. Such attitudes moved Westward with men of later generations, although one of the first successful government attempts at conservation came with the formation of the U. S. Forest Service in 1905.



By 1900 the total United States population had passed 75 million. There was an average of 25 acres to supply the food, fiber, and other needs of each person. The per capita acreage of land shrank to 15.5 by 1930, a reduction of 40 percent in three decades.

### Steps to Conserve Soil

Before the 30's, it became clear that our soils were being eroded and lost. Several university experiment stations had established plots to determine the effect of slope, ground cover, soil type and tillage methods on the rate of runoff and soil removal. The early activities of the Extension Service throughout the country in soil and water conservation emphasized terracing. County agents, throughout the Southeast especially, labored with improvised equipment to help farmers construct them.

In 1929 a federal appropriation was made to study the effects of erosion and ways to control it. Eight erosion control experiment stations were formed, and in 1933 an emergency agency was created. Watershed demonstrations on 25,000 to 100,000 acres were established in strategic locations.

Two years later in 1935, USDA established a permanent agency to handle soil conservation programs. By 1937 it became apparent that conservation could not be undertaken alone by government bureaus or agencies but needed the help of the people themselves. That year soil conservation districts began to emerge and new action programs took place across the nation. Today 96 percent of our farms and ranches are included in locally-governed soil conservation districts.

An outstanding accomplishment of the period was to bring all appropriate sciences to bear upon the problem of use of land. Agriculturalists, engineers, foresters, agronomists, biologists, soil scientists, economists, and others contributed. A new viewpoint emerged: land has varying capabilities and we should try to put each acre into the use for which it is best suited; we should treat land with methods that relate to the needs of the land and the plans of the land owner or user.



Today millions of acres of land have been mapped and surveyed. Woodland has protection from fire, wildlife acres have been developed, and waterways grassed, cropland terraced and contour cultivated. There have been shifts from cotton, corn, and other row crops in the Southeast to pastures for dairy and beef cattle. Modern ranchers of the South are using more lime and fertilizer on their pasture land than they ever thought of using on cotton and other cash crops in years past. New grasses and combinations of grasses and legumes are making it possible for Southeastern farmers to pasture cattle almost all winter.

In the Western plains where wind erosion was a menace a few decades ago, good grazing exists in increasing abundance. Abused lands in the dry plains have been planted as suitable grasses became known and identified.

#### Steps to Conserve Water

The scientific management of rainfall on small watersheds provides an invaluable resource for many communities, since good water grows in importance as an asset to industrial development, recreational facilities, and stable rural population.

Irrigation in the West has been practiced for centuries. The canal-building Hohokan Indians of the Southwest had built canals to irrigate their crops in the salt river valleys as early as 600 A.D. Later Spanish settlers established modest irrigation works. By 1890, some 250,000 acres of land had been put under irrigation. Other places of the West became useful for agriculture through reclamation until by 1900 some 7 million acres were under cultivation.

Today more than 30 million acres of land are watered by man-made devices. The water supply of the Western States is not great and it must be carefully developed and adequately divided to serve all needs. Snow surveys by the USDA forecast water supplies and help determine possible needs as they arise and are planned for future developments.



## Steps to Conserve Forests

To many early settlers American virgin forests were vast and stubborn obstacles to be hacked, burned, and uprooted until the land was ready for the plow. Through the years this huge supply of wood became fuel, lumber, and other products needed by an expanding nation. Forests were used as if the supply were limitless. As a result of clearing land, lumbering, and uncontrolled fires, an estimated billion acres of forests were reduced by 1/3 between 1620 to 1900.

The situation changed in the past several decades. Large reservations of public forests, starting in 1891, and extensive repurchase of lands in the 1930's formed our system of National Forests which now cover 181 million acres and include 16 percent of the commercial forest land. The national forest system (including four million acres of National Grasslands) are "lands of many uses" - timber, water, forage, recreation, and wildlife. The National Forests are managed under the principle of multiple use, at a high sustained level of productivity, each resource use in harmony with the others. Organized fire protection of timber lands on a cooperative Federal-State basis began in 1911, and fire control has been extended to nearly all forest lands. Strong state departments of forestry have been established in most states to help carry out various programs of aid to private forest owners. Forest industries have adopted intensive forestry programs. Comprehensive programs of forestry research have been developed. Education in forestry has expanded and 40 institutions train professional foresters to manage public and private forest lands and timber operations. The downward trends in forest resources have been arrested and reversed as the result of such efforts by public and private groups and a general change in public attitudes toward natural resources. Smokey Bear, the popular forest conservation symbol, can take credit for much of this change in attitude.

The logger's main aim a hundred years ago was to deliver logs to the millpond at least cost and with little attention to the remaining trees, fire hazards, and the slopes he left naked. Now we are concerned about sustained yield, soil erosion, and water yield.



Similarly, time was when losses from insects and diseases could be tolerated because our forests seemed inexhaustible. But today most of our virgin forests have been cut over, and the large demands for forest products mean that we can no longer accept those losses.

### Relationship to Wildlife

In years past our forest lands were a vast wilderness filled with a wonderful, intricate world of wild creatures, frequently more man's enemy than his helpmate. Today, however, a beneficial kinship exists between man's domain and nature's and between wildlife and its home.

Nature once kept a balance between animals and available foods. Now while man kills some animals and captures some fish, he also carefully tends the homes of others and makes it possible for them to live, reproduce, and enjoy their wild freedom. Creatures of the wild, inseparable from the forest and farmlands which provide them with their daily and year long needs, have their habitats managed by man's creation of openings and edges and by his planting of food, developing of water sources, and controls of timber harvests. In the same area where cattle graze, sheep roam, lumbermen obtain timber and urban and rural people camp, hike, ski, and hunt and fish.

### Broad Concepts of Food Conservation

Today about one of every five acres of perishable agricultural products is lost through waste and spoilage before it reaches the table of the American consumer. Clearly this is an area for conservation. Every citizen must pay for this waste in the form of higher prices and, in some instances, lower quality products.

We can remedy this, for already we know how to reduce waste and spoilage during marketing to put a better quality product before the final user. We can put apples in controlled storage and remove them several months later in the peak of condition ready for eating. Eventually we will be able to look into fruits and vegetables to find quality defects without cutting them open.



Such things already have had effects on farming. Modern marketing makes it possible for farming to exist figuratively everywhere in the Nation. How could there be volume lettuce production in Arizona and California without an efficient marketing system to get the product to customers almost everywhere in good condition? The same could be said of many crops in areas all over the United States.

### The Arts - Agriculture's Contributions

The scope and grandeur of America's land, its people, and its changing scene has been dramatically portrayed through the years in all art forms. When an American goes abroad, he talks of many things--our riches, our natural resources, our comforts, our size, our farms, our cities. Rarely, if ever, does he talk about our art unless he is a specialist in art. It has been said that we know too little about it.

And yet here, too, our pride is justified. America has produced a school of art which in the past 100 years has arisen to challenge any other country that claims leadership in the arts.

All civilization arises out of the ability of farm people to produce a surplus of food, fiber, and other raw materials derived from living things: that is, to produce more than their own families require and to exchange it for other goods and services. The arts could not be born until mankind had leisure to do something more than spend all waking hours in hunting or growing food, clothing, and shelter.

Rural life and natural life have always had close associations with artists of all types--from painters to photographers, from poets to novelists. And yet American art has retained an originality that rarely has been deflected from realism, mirroring such things even as local sports and customs, so that we now have documentary evidence to light our way through history.

American art forms have created a wonderful panorama that stretches before our eyes. The great leaders of American arts are here along with the lesser known



ones. In painting, the rural environs and landscapes first inspired the Benjamin Wests, the Raphaelle Peales, the Gilbert Stuarts, Washington Allstons, and the John Meagles. Later came Paul Seifert, Charles Hofmann, John Frederick Kensett, and the great naturalist-painter John James Audubon. We have the recorders of the making of a new nation from new lands--George Catlin, Alfred Jacob Miller, Charles Wimer, Frederic Remington, and Charles Russell. And as the nation matured, we developed painters like George Inness, Winslow Homer, Thomas Eakins, Charles Sheeler, Thomas Hart Benton, John Steuart Curry, Peter Hurd, Grant Wood, Waldo Pierce, and Tom Lea. Always we have had a host of eager amateurs trying to capture the world about them. Occasionally, one emerged to professional status--John Kane, Horace Pippin, and Grandma Moses.

Handicrafts, too, have reflected the rural heritage of our nation. The spirit lingers on of the earliest quilting bees and of the enforced needlework as youngsters made samplers. When colonialists and pioneers developed functional furniture with crude tools, they started a design trend that today holds a firm foothold in many modern homes. Architecture developed a distinct rural form through churches, homes, and barns--taking various shapes by regional and climatic differences, changing through the years as the needs of the people changed and new technologies developed to make old ways obsolete.

Film and photography, just as with painting, have documented rural life in inspiring and expressive ways. From the early attempts of Brady, Jackson, and Weston and the assemblage of Farm Security Administration photographs by Rothstein, Vachon, Shahn, Wolcott, Lee, Mydans, Evans, Lange and Stryker to present-day coverage of agricultural events by thousands of contemporary photographers, still photography has preserved another form of classic comment on our history. In motion pictures, we have the stirring government documentaries of the 30's--"The Plow that Broke the Plains" and "The River"--plus dozens of more well-known features in the Disney nature films and those of lesser-known producers.



Literary achievements also have always brought an extraordinary array of richly varied talents who have depended upon nature and rural life for material. There are the poems and stories of Whittier, Riley, Whitman, Carlton, Emerson, Forest, and Sandburg to name but a few. There are the novelists of the American scene, including Clemens, Ward, London, Steinbeck, and Lewis. Editorialists and more technical writers exerted considerable influence upon the people in years past--Horace Greeley's editorials were eagerly awaited by rural people; the farm magazines, newspapers, and almanacs reported and intensified interests in rural environments long before other means of communication lifted our society into an awareness of the challenges of perpetual change. Coupled with words, too, were the strains of folk and country music and dances, reflecting change, developing change, and helping to move our people toward a goal where progress never ended.

For change and progress are life itself, especially in America. And life, especially in America, is the heart and soul of art.

#### SCIENCE--ESTABLISHMENT OF RESEARCH CONCEPTS IN AGRICULTURE

From the beginning, agriculture has been an enterprise of trial and experiment. Jefferson and Washington experimented with fertilizers and lime. When the Department of Agriculture was first established, some of its employees carried out experiments on disease eradication and new seed varieties. Eventually the Department established experimental farms and laboratories in various parts of the country to work on specific problems.

For example, there was an experimental tea farm in Somerville, North Carolina, from 1880 to 1887. Most experimental work, however, was carried out in the state agricultural experiment stations. Guiding research was the Arlington Farm, a tract of about 400 acres on the Virginia side of the Potomac River opposite Washington, acquired in 1900.



Also in 1900, a USDA scientist demonstrated one of the first results of marketing research, namely, proper refrigeration techniques in shipping oranges from California and apples from 17 States for continuous exhibit at the Paris Exposition.

Experimental work headquarters were transferred in 1941 to Beltsville, Maryland, 15 miles from Washington, where a farm of 475 acres had been acquired in 1910 for the investigations of the Bureau of Animal Industry in animal husbandry and dairying.

To tell farmers about scientific developments, the Department began issuing Farmers' Bulletins in 1889. In 1894 it started to publish the Yearbook of Agriculture--the books that since 1849 had been known as "Part II, Agriculture of the Annual Reports of the Commissioner of Patents and Agricultural Report."

The Agricultural Research Center near Beltsville, Md., has been the core of revolution and progress in agriculture since it began. It is the focus of a research system that reaches into all the states and territories. It is the home office of 4800 scientists who carry on a research program that comprised 3,000 projects in 1962.

#### Activities of the Center

About a fourth of the Department's scientists are at Beltsville. They work primarily on broad, national research problems. The others work at 315 field stations, among which are facilities used cooperatively by the Department and the Land-Grant Colleges and Universities. Behind what one sees when he visits Beltsville is painstaking work, inspiration, and the dedication that precedes discoveries. An example lies in the story of the basic relationships between plants and light.

The first step was taken in 1918 when USDA scientists learned about photoperiodism, the principle that the relative length of day and night controls the



flowering and development of plants. This finding led to the discovery and isolation in 1959 of phytochrome, the light-absorbing pigment within many plants that triggers the mechanisms for their development. To study photoperiodism more fully, scientists built plant growth chambers in which light could be clocked to go on and off at desired intervals. They built devices for breaking light into its different components to study their effects, using both incandescent and fluorescent, sources and various filters. They applied lights from various parts of the spectrum to the whole plant to seeds, and to single leaves. They used artificial light to add seconds, minutes, and hours to the normal daylength. They worked with the normal daylength and then added night periods at various intervals during normal darkness. They recorded every detail, response, and timing as carefully as if their lives depended upon it.

The discovery of phytochrome came four decades after the discovery of photoperiodism. Scientists at Beltsville continue their research today, convinced that still greater findings lie ahead.

Take the new knowledge of the DNA molecule. It opened a whole new field of agricultural production and marketing. Simply, the DNA molecule carries the message or blueprint for the growth of any living thing. Science is now learning how to change this message. For example, it may be possible to change seeds from one variety to another without cross breeding. Also scientists may be able to change the marketing characteristics of a product to obtain a longer storage life. Currently scientists are conducting basic research designed to learn more about the process of the DNA molecule. Once man has complete knowledge of the DNA molecule it may be possible for him to dictate the life process of any living thing. For example, we may learn to eliminate birth defects in humans and animals and do away with undesirable qualities in agricultural products such as peach fuzz and excessive fat on meat.



## Research Touches Everyone

Everyone--from those in the smallest town to the over 7 million residents of the largest city in the United States--has been touched by agricultural research. We all eat food and wear clothing. We all use wood products. Yet through research, agriculture's importance to all people in the United States has reached into realms not so immediately recognizable as agriculture.

Ever ride on a jet-prop or pure jet airplane? If you have, chances are you were whisked through the air with engines lubricated by animal or vegetable oil. Agricultural research has also led to a more healthful nation. For instance: today we enjoy nutritious food unheard of in the not too distant past. This has improved health and helped toward the virtual eradication of such nutritional disorders as pellagra, rickets, and goiter. Better nutrition has also affected the sharp decline in tuberculosis and some infectious diseases of childhood. We are taller and heavier than we used to be. Average life expectancy rose from 47 years in 1900 to 69.3 years in 1957. The annual death rate per thousand persons dropped from 17.2 in 1900 to 9.4 in 1956.

New methods of doing things in the agricultural marketing system have resulted in thousands of new jobs producing new forms of equipment and supplies. For example, developments in packaging have created a whole new industry supplying the special films and wraps that are needed by processors of food and fiber. The building industry has benefited by the thirst of our marketing system for new food distribution centers, storages, and handling facilities. And as more products come from more areas of the country more miles away, transportation companies have benefited.

Today we have studies to improve farming methods, to improve cooperatives, to improve plant varieties and breeds of livestock, to make all aspects of farming more efficient, and to find better means of conserving and wisely using our precious resources of soil and water. We conduct research to learn better ways of



managing household resources. We are seeking new or improved ways to use agricultural products. In addition, our research helps to eradicate, keep out, or control insect pests and plant and animal diseases that threaten us all. Advances in food processing, better understanding of the role of different foods in human nutrition, new methods of feeding livestock efficiently, life-saving antibiotics, and knowledge of how to use land and water more effectively--all based on agricultural research--contribute to the prosperity and well-being of all the people.

### Breadth of Agricultural Science

Agricultural research achievements that have made life better go back a long way. In 1889 for example, USDA scientists first discovered that ticks transmit the parasite which causes Texas fever in cattle. This finding not only made possible the control and eradication of cattle fever but also provided the key to effective control of pest-borne human diseases--malaria, yellow fever, typhus, and bubonic plague.

The aerosol device with its infinite number of uses in American life was devised by an agricultural scientist in 1941 to dispense insecticide. Other agricultural scientists developed frozen orange juice concentrate, chemically treated cotton fabrics to give them wash-wear convenience, helped find methods of preserving the fresh quality of foods through quick freezing, and worked with industry to develop mechanical devices that have permitted U.S. farmers to establish a steadily climbing record of man-hour productivity.

Important progress has been made also in developing chemically modified animal fats for use in industrial plastics. Research with cereal grains has developed a method for producing dialdehyde starches from corn, valuable for many industrial uses. Another new corn starch, amylose, shows promise of being industrially useful in making adhesives, film, and paper products. Fabrics with resistance to flame, rot, and mildew and with soil resistance and other improved



properties have been developed. There are many other improved and new products from agricultural research--potato flakes and potato granules; convenience foods with proven appeal to consumers; dehydrated eggs with fresh-egg flavor; two-way stretch cotton bandages; and dextran, the safe and storable blood plasma extender for medical use.

Home economists have found ways to raise levels of everyday living. They have designed and exhibited a series of energy saving kitchens. They have developed special clothing that meets many of the problems of physically handicapped homemakers in moving about and doing housework; devised a formula for predicting and thus controlling shrinkage of knit fabrics in laundering. The standardization of clothing sizes for women and children has depended heavily on body measurements made by home economists.

From each dollar you spend for food, an average of 60 cents goes to pay the cost of distribution, transportation, and processing. Marketing research has led the way to holding down the marketing share of the food and fiber bill. It also has shown farmers how to leave waste in the field while moving only the edible part of the product to market. Carrots only a few years ago were shipped with their tops still on. This not only was costly in terms of paying transportation charges on a portion of the product that would never be used, but the tops acted as wicks, robbing the carrot of moisture, causing them to spoil faster. Today the tops are left in the field and we get a more sanitary carrot with longer keeping-power in plastic bags at a lower marketing cost.

Since the production of one out of six acres goes abroad, an important area of research analyzes and develops foreign trade in farm products. These studies of foreign markets began in the 1890's.

#### Statistical Analysis and Reporting Important to Agricultural Science

Crop reports keep agricultural services informed on total acreage, yield and production; livestock numbers; average prices for crops, and values per head of



livestock--all of considerable value to commodity exchanges. Today those reports are supplemented by a Market News Service which enables a quick flow of information on prices, supply, and market conditions. Farmers, handlers and processors of food, extension workers, cooperatives, transportation agencies, producers of many goods, and people generally are among those who use the information to make decisions as to buying, selling, producing, and ordering.

Actually, there are forms of research in literally every phase of agriculture, from forestry to engineering, and it has changed American agriculture in limitless ways and has changed the entire face of our land, both rural and urban.

#### AGRICULTURAL EDUCATION--UNIQUE IN THE WORLD

Agriculture's innovations for extending scientific information to the people of the United States are truly unique and envied throughout the world today.

Agriculture's contributions to American education aren't limited to Land-Grant Colleges and to adults. One out of every three children attending U.S. schools--about 14 million children--ate nutritionally-balanced school lunches, provided under the National School Lunch Program in 1962. About 2.7 billion half-pints of milk also were served to children under a separate program--The Special Milk Program. Educators use these agricultural commodities as they teach many things--nutrition and manners, for example. And in many instances, improved nutrition makes it easier for the child to learn all his lessons.

Many other countries of the world have been strong in research and have abundant natural resources, but none of them has been nearly as successful as the United States in putting scientific results to work on the day-to-day problems of increasing farm productivity and efficiency or improving the levels of living of their people. As a result, many nations today are studying our extension methods and are patterning their own adult education programs after those in the United States. In fact, the United States has been far from selfish in its willingness to share its agricultural knowledge, from the first technical aid program to the Alliance for Progress.



The objective of solving local problems by county agents or farm advisors with Department of Agriculture and college research evidence has been basic to the technological revolution in our agriculture and family living. Farmers have received information quickly after research on how to double and redouble yields, fight insect and disease pests, use machinery to cut labor time and costs, irrigate with maximum efficiency. They have learned of and received new and better varieties of crops and management techniques to greatly increase efficiency and/or cost.

Sixty-eight Land-Grant Colleges and Universities today enroll 20 percent of the country's college population, grant 40 percent of all doctoral degrees, confer approximately 50 percent of doctorates in science, engineering, and the health professions; all of those in agriculture and 25 percent in arts and languages, in business and commerce, and in education itself. Further testimonial to the quality of teaching, research, and service under this type of program is the fact that 20 of 38 living American Nobel Prize winners who went to college in this country earned their degrees from Land-Grant institutions.

The value to the American people of the cooperative Land-Grant and Department of Agriculture research alone exceeds manyfold the total amount expended on these colleges since they came into being.

#### HUMAN RESOURCES AND AGRICULTURE'S DEVELOPMENT

Of all man's material needs, the first and most basic is food. Because of the willingness of the American farm operator and the entire agricultural system to adopt the innovations of science and sweat through to their successful use, today 26 people and the farmer have their daily bread. The farmer's success provides time to thousands of others so they may become scientists and leaders of state, captains of industry, and masters of finance, technicians and engineers, clerks and stenographers, teachers and truck drivers. Without our agricultural productivity, the people fed and clothed by agriculture would be grubbing desperately for food as are many people in less fortunate countries throughout the world today.



If it is possible, as many men contend, that a main cause of wars and revolutions results from different living standards between groups of people, than it also should be likely that a part of the answer must lie in spreading to the world the rather special magic that has enabled American agriculture to free the nation, to take its place as the best of the world. People with hungry bellies make poor neighbors; they also make poor scientists, poor factory workers, poor administrators, poor everything. It is hard to focus on a star when you can't see where the next meal is coming from.

### Today's Farmer and His World

One of the most prevalent myths today is that the average U.S. farmer is rich; that where he doesn't make a profit from the poor consumer, he gets it in subsidy from the government. If somehow the long dry columns of figures could be made to come to life, the "average" United States farmer of today would look something like this:

He is 50.5 years old.

His farm covers 302.4 acres.

The value of his land and buildings is \$33,242.

For each hour he and his family and hired hands worked on the farm, each received 82 cents in 1960. (In a factory they would have averaged \$2.29. Had they been engaged in distributing and marketing the food and fibers they raised they would have average \$2.14 per hour.)

His per capita income in 1960 was \$986--non-farm per capita income was \$2,282.

In 1960 the "average" farmer received \$173 paid directly to him under farm programs. Since 1954 he has averaged farm program payments of \$152 per year. Total gross direct farm program aid to all farmers was equal to only 1.8 percent of the 38 billion dollar total gross farm income for that year.

The American farmer is a sturdy individualist who works hard to do as much as he can for himself. He carries this spirit of self reliance as far as he can in



his individual farming enterprises. But he joins with his neighbors to do many jobs too big for him to do alone--what could perhaps be called an extension of his individual self reliance into a community self reliance.

He joins with his neighbors to form soil conservation district associations to help hold the fertility of their soils by soil conservation measures such as terracing, to buy and sell more effectively by forming and using farmer cooperatives, and to bring electric light and power to their farms by organizing and belonging to rural electric cooperatives.

To repeat: the real measure of today's agricultural revolution lies in the shorter time lag between the discovery, acceptance and application to the farm and the marketing system of the new products of science and industry. The true dimension of the agricultural revolution lies in the changing mind and attitude of the farmer himself and in the entire agricultural industry.

Today's farmer is no longer on the defensive against the forces of nature. He has taken the aggressive. He is an entrepreneur who uses business management techniques to combine land, labor, and capital to maximize the profits of his enterprise.

He is as vitally interested in the techniques of distribution and marketing as he is in improving the productivity of his farm. He expects his family to have and enjoy the same amenities of life as do his city cousins. He knows that in order to get them he must--like industry--run his enterprise more efficiently and at a profit. More and more he is doing so.

### The Changing Agriculture Is a Changing People

So when we attempt to describe what is taking place in agriculture today we often fail to evoke a true image of what's happening to the farmer, his way of life, and his relationship to the economic community where he finds himself caught between two worlds.



What is happening is not only that the physical characteristics of his farm and environment are changing but more fundamentally the farmer himself is changing. The time honored agrarian ideas that enshrined frugality and hard work as ends in themselves have given way to a new era in which the farmer wants the time and opportunity to enjoy the fruits of his labor.

For many generations changes in farm work and farm life took place so slowly that the farmer and his family could adjust easily and take them in stride. Today the farmer finds himself in a world where all is in flux and everything about him is changing so fast that he finds himself transformed..

The size of his farm is changing; it is getting larger and larger. If once we thought a 160-acre farm to be the optimum size, it took five acres to feed a horse and eight horses to work those 160 acres. More than a quarter of the productive acreage was used just to support the animals to work it. The working acreage of a 160-acre farm was therefore only 120 acres. With mechanization the smallest profitable farm today is 260 acres and all of it is productive, although of course type of farm has a great deal to do with size of farm.

With the increase in the size of the farm the farmer also has found that his techniques for managing and working the land had to change. Amount of his investment grew with the size of the land. Investment in farm machinery and equipment since 1940, for example, increased six times yet much of the equipment investment has taken place in just the last 6 years.

But as the size, complexity, and income of his farm increased, the farmer found himself also saddled with another and much less welcome statistic. Each year it has cost him more and more to produce. In 1940 he spent 46 cents out of every dollar he received for production costs exclusive of his own labor. In 1959, he was spending 63 cents out of every dollar.

Not every farmer has been able to make such changes. Under the pressures of hard competition the submarginal farms have begun to drop out. Except for a peak in



1935, the number of farms in the United States has steadily decreased since 1910, as has farm population.

Fewer young people are returning to the farm as farm people increase in their mobility and abilities to take advantage of educational opportunities. Mr. "average" Farmer is getting older and as he gets older he turns more and more to mechanization and time saving materials and methods to help him out.

### Agriculture's Broadened Environment

He now lives in an environment that figuratively adjoins the world. Ninety-seven percent of the farms in the United States have electricity. The farmer sees the same television programs, listens to the same radio stations, reads the same newspapers and magazines as his city counterpart. He is now a part of the world he lives in--no longer isolated and apart.

People are the main element in agriculture--people who work to produce food so others can eat and fiber so others can be clothed; people who market that food and fiber; people who process and handle it from producer to consumer. This human side of agriculture also is stressed in the supervised credit service of the Department and in its housing and electrical programs. Through the years, these programs have served families who could not have made the adjustments they had to make without assistance.

The success in agriculture has brought its reward, but by and large, the reward has gone to the American consumer and not to the American farmer. Doubters have only to count the number of items on supermarket shelves that weren't there 15 years ago or less.

The decline in the prices farmers receive for their produce and the increases in the prices they pay for machinery, fertilizer, and other production materials have meant generally that farmers simply don't get as much net income as nonfarm people. Increases in production and resulting decreases in prices are an important part, but only a part, of the problem of agriculture. Today's farmer is at a



disadvantage economically for three basic reasons: first, individual producers do not have the power to adjust production to current demand. American agriculture can produce more than can be marketed at prices that give farmers a fair return on their investment and labor. Second, farm costs have risen faster than farm prices-- a cost-price squeeze that has put the farmer at an economic disadvantage. Third, wide underemployment exists in agriculture.

More is to be sought for than a recognition and an understanding of the farm problem. We need to realize the importance of agriculture to the economy. Agriculture is a creator of employment, a source of tax money, a demanding customer for materials and equipment, and an important consumer of things that all people buy-- such as food, clothing, drugs, furniture, appliances and other goods and services.

We have moved from an age of scarcity to an era of abundance, but we have not yet learned how to live with abundance. We must move aggressively to cope with the problems of today rather than continuing to think in terms of scarcity. Time is running out, however. If America is to hold its position of world leadership and enjoy continued economic growth, conditions must be corrected soon.

Today, using existing and new authorities, agriculture is attempting to redirect its efforts to adjust to changing times. The ever-increasing number of breakthroughs of this age of abundance, from which all Americans are benefiting, have in themselves helped create new needs and new directions.

#### LAND AND PEOPLE - THE SHAPE OF FREEDOM

One result of the agricultural revolution has been to bring farm and city closer than ever before. In this age of specialization, each depends on the other. The farmer depends on the city and town worker to supply electricity, gasoline, hardware, tractors, milking machines, fertilizer, feed, credit, and bathtubs, kitchen stoves, newspapers and even most processed food. The city worker expects



the farmer to continue supplying a never-ending stream of food, fiber, wood, and other products. In addition, city people are finding an increasing opportunity for a wide variety of outdoor recreational pursuits on farms and ranches.

#### PROBLEMS RESULTING FROM IDEALS

As agriculture became better able to supply the country's needs, through its more efficient means, less and less farmers were needed to do the job. And yet many of the people who left farms, became the labor force of other industry or found places in the professions, in management, and in private business. In short, they moved to the city.

From 1950 to 1960, the nation's urban population rose 29.3 percent while the farm population dropped 38 percent--20 percent under old definitions. Urban people totaled 125 million in 1960; farm people, 15.6 million. Of the nation's 3,134 counties, only 361 are in metropolitan areas, yet 84 percent of the country's population growth in the 1950's took place there. Almost half of all counties actually declined in population.

#### Rural Welfare Creates City Welfare

Rural America has its problems, along with its strengths. And those problems quickly became the problems of urban America. For example, in New York City about 1 out of 10 persons over 25 years old failed to complete five years of school. But in some counties of the United States, more than 4 out of 10 persons over 25 failed to make it through the fifth grade. When increasing efficiency of agricultural production throws such persons out of a job they pour into the large cities. Because of their poor education, they are often unable to find or keep work in the cities--adding to the urban problems of unemployment, illiteracy, slum housing, sickness and crime. And they add to the welfare burden.

The cities, therefore, have a direct and vital stake in developing rural areas so that these people can get employment, education, and health facilities where they are.



The place to attack this welfare problem is in rural America. It makes common sense--and costs less money, too--to provide more opportunities on our farms, in towns, and small cities.

When people move away from farms, they primarily are young people. Over a period of time, therefore, rural counties become weighted with middle-aged or elderly people. Since the young people are the potential parents, the number of young children also declines.

A smaller proportion of people in their prime working years (25 to 44) live on farms, and rural and urban people differ these days in their health. For instance, farm people have more heart ailments than city people. Farm people tend to be more limited by chronic health conditions. They have more days of sickness but about the same number of days sick in bed as city dwellers. Farm people visit doctors and dentists less often, use hospitals less often, possibly because it is more difficult to visit them. Every type of health insurance coverage is considerably below both city and nonfarm rural areas too.

The rural areas have built new schools and have improved educational facilities, but the gap between educational levels of farm and city people has widened--another reflection of the loss of young people.

#### Nutritional Gap Knows No Boundaries

Americans have food in abundance now, and a wider variety than ever before. One reason for that variety is the lessening of seasonality possible by refrigerated cars and better ways of preserving food. But we still have to watch our standards for bacterial content of milk, inspect our meat, police false weights and measures, discourage false labeling and exaggerated claims for products, and develop more research to discover what we should eat for nutritional health and educate our people to tell us and motivate us to eat what is right. Even today, despite our abundance, many families get too little calcium, not enough ascorbic acid, and one-fourth of our population, according to estimates, is overweight



mainly because we eat too much food in relation to our physical activity. Millions of youngsters have the opportunity to receive at least one nutritious meal each day in the School Lunch Program, yet many nutritionists say teenage malnutrition is one of our most pressing youth problems today.

#### Population Pressures Abolish Old Needs

In some areas of our country farm acreage is fast being absorbed by city and factory. Lands in fringe areas have been abandoned or lie partly used. From 1950 to 1960, about a million farm acres a year were needed for growing cities, highways, airports, and other intensive uses.

Just as changing needs have required changes in residential and industrial architecture, changes in farming methods and agricultural marketing make many existing buildings obsolete and inefficient. New kinds of structures often help reduce production and marketing costs. They save labor and make livestock feeding more efficient. New food distribution centers save consumers, marketing agencies, and farmers millions of dollars each year and provide better protection for perishable agricultural products. Savings in preserving stored crops or in producing and marketing livestock, milk, or eggs can offset costs of construction.

Man-made skylines on farms are dwarfed by the pattern of office and factory buildings in cities, but the value of service buildings construction has been about 1/10th the value of all other private non-residential construction in recent years.

#### CONSERVATION: PROBLEMS OF LONG-TERM INTEREST

Traditionally, the United States has been blessed with an abundance of natural resources. The public has kept a continuous interest in natural resources through tax powers, reclamation, and the right of public domain. But a national responsibility for these natural resources and their careful use developed slowly. The nation awoke after millions of acres were ruined--some through needless exploitation,



some through greed, some through ignorance, and some through necessity. The depression of the 30's, particularly the farm depression, brought vivid proof of damaged lands and the awakening.

Studies of farmland damage showed that tenant and sharecropper operations often contributed to erosion and to blighted farms, communities, and entire regions. When, in the 1930's, widespread rural poverty could no longer be ignored, new laws provided funds, technical aid, and improved policies to encourage farmland conservation and provide credit for farm needs and to finance farm ownership.

### Types of Reserves

In our 50 states, there are nearly 2.3 billion acres of land. About 80 percent of this land is agricultural, including forests. A fifth is cropland, somewhat over a fourth is grassland pasture and range, and a third is in forest. More than 50 percent of the land area in the 50 states is privately owned. Most of the nation's crop, range, timber, and pasture production is on this private land.

Federally owned land makes up a third of our land area and primarily is that left over from the great migrations. It is used for timber, grazing, mineral development, recreation, watershed development, and wildlife. These are our reserves for timber, minerals and water. About 5 percent of our land area is owned by state and local governments.

In 1959 there were 633 million acres of pasture and range, 458 million acres of cropland, 773 million forest acres, 157 million for special use (cities and towns, highways, railroads, parks, and farmsteads), 277 million acres of waste (barren, desert, rock, or swamp).

No longer is acreage the major production tool. Capital and labor, use of technology, soil conditions, water, and weather bring extreme variations in land productivity. Four basic resources are necessary to agricultural production: soil, water, grass, and forests. Each is renewable. Through the proper means and methods of production, each can be used profitably forever.



## Determining Best Use of Land and Water

In 1961 the first National Inventory of Soil and Water Conservation Needs yielded the first comprehensive knowledge of the extent and condition of privately owned land. Now soils are classified according to their capabilities, broadly separated into land suitable for cultivation and land that is not. The Inventory found that nearly half of privately owned agricultural land, about 640 million acres, is suitable for regular cultivation. Only 60 percent of this acreage is now being used for cropland, assuring us a comfortable reserve that could be cultivated when needed.

Almost 75 million acres, better suited for permanent grass or trees, is now in cultivation. This is about 30 percent of the 170 million acres of poorer cultivated land and presents a continuing problem in conservation.

The Inventory showed that nearly two-thirds of the Nation's cropland needs conservation treatment of some kind. Erosion is the most widespread problem, and is the dominant problem on 53 percent (234 million acres) of the total cropland. Excess water is the dominant problem on 22 percent (94 million acres) of the total cropland; unfavorable soil is the dominant problem on 13 percent (55 million acres) and adverse climate on 6 percent (24 million acres) of our total cropland.

By 1975, 101 million acres are expected to shift to new uses, needing newly established conservation practices. Of our present cropland, 272 million acres need conservation treatment--that is 62 percent of our total. Almost 3/4 of private pasture and range land needs such treatment and more than half of private forest and woodland (241 million acres) needs it. Two-thirds of the nation's small watersheds need community projects for flood prevention and water management. Many watersheds need action in irrigation development, drainage, and control of erosion in addition to reduction of flood damages.

Awareness of our critical water problems has become more evident as the population has grown. Actually, in some places, we are short of water. In other



places, water is polluted or of low quality. Awareness of these problems has led to new ways of using and treating water. Much has been done to reduce erosion, reduce sediment and floods, and at the same time, yield the maximum amount of good water for many uses. Still much needs to be done.

#### Timber Developments--Bringing Up Potentials

About a fourth of the country's land area is used for timber production. These 530 million acres of commercial forest land are 70 percent of the 773 million forest acres in the United States. About 3/4 of the commercial forest land is privately owned; mostly in small farm tracts.

Major consideration in the present timber situation is to prepare for the future. Timber production is time consuming and complex. The time to grow timber for a crop exceeds that of any other plant--for instance, much of the timber needed 40 to 50 years from now must come from trees established and growing now.

Productivity of forest land in farm and other small ownerships is far below potential. Substandard stocking after cutting is especially serious. Also, small ownerships are the least adequately protected from fire, insects, or other losses. Timber quality is uniformly poor. Volumes per acre are far below optimum growth conditions and few small forest properties are managed to produce timber efficiently.

In fact, most forests need improved management to realize full growth potential. About three-fourths of the nation's total timber volume is in trees large enough to be manufactured into lumber, and sawlogs constitute by far the largest portion of the timber products harvested each year. But as the western old-growth is harvested and eastern stands develop, softwood production will gradually shift, mainly to the Southeast.

We need to make new inventories to provide for future needs. We need to stimulate growth to make sure we have enough quality timber to meet requirements of years ahead. We need to replant at least half of the fourth of our present



commercial forest land that now is inadequately stocked. On the rest, we need to provide more effective management, natural regeneration, and improved protection. Millions of acres need improved harvest and culture practices to increase the growth and quality of timber products. Only a few of the measures needed include removal of poor and defective trees, clearing of competing vegetation, and pruning and thinning of immature stands.

### Closeness of Wildlife, Land, and Human Problems

Even in an age when more and more people are intruding on Nature's way of doing things, we have gained much knowledge about the intricate world of wild creatures and thereby a deeper appreciation and understanding of its scope. The legal, proper way of hunting some game animals, while still appearing cruel to some, nevertheless helps Nature keep a balance between animals and available food.

Strangely, many of the problems of wildlife conservation are closely related in their initiation and in their solution to the same problems of a growing human population. Farm land and forests cannot be separated from many animals nor they from the land and forests. About 80 percent of the small game hunting in America is on farm lands, and good farm land management plays a vital role in protecting and improving our wildlife populations. The forest provides many wild animals with daily and year-long needs, but still a dense forest can be a poor home for some kinds of forest animals, just as a dense forest does not produce sizeable timber for lumber production. Conversely, wherever a large tree falls or the forest is otherwise opened to the sun, the ground becomes covered with many kinds of vegetation. Wildlife then tends to concentrate along these places where food and cover requirements are in relative abundance. (Obviously, however, such practices are more akin to Nature's way than wanton destruction of large areas, whether for timber harvesting or clearing for new highways and manmade activities.)



Foresters and wildlife managers understand relationships and make use of this knowledge to improve the food and cover conditions. This management of habitat is carried on by creating openings, planting food, developing water sources for the forest animals, and harvesting timber.

Proper management of forest areas that also are adapted to grazing by cattle tends to improve the habitat for deer and some other wildlife. Fish life in streams is affected by the surrounding forest. Good forest cover prevents silting of water courses, discourages erosion, and provides shade to cool the water and cover under which fish can rest. The interrelationships of man and wildlife are typified by the needs of each for clear, pure water in continuing flows.

#### Little Fear of Resource Exhaustion Today

Conservation of resources has been an important part of the revolution in agriculture. But agriculture itself has undergone a revolution. Modern science has changed its goals and methods in a generation. No longer do we need fear an ultimate exhaustion of our natural resources; instead, the goal today is to use and manage resources in a way that will enable the greatest benefit from them, now, and in the future. Wise use, rather than restraint of use, is the keynote.

The acreage of harvested cropland has remained fairly constant in the past 50 years, yet farm production has climbed steadily. Of course, by the year 2000, we may need more than twice the agricultural production we have today to supply an expected population of 329 million. At present yields and today's rate of efficiency, that would require 400 million acres of additional cropland. Since we do not have that many more acres suitable for cultivation, we will have to meet that demand for products from the land already in agricultural use.

#### More Food Possible With Less Land

This can be done, we think. In fact considering the rates of which yields per acre are rising, we should be able to produce more from less land than now is being



cultivated. We will have to use even more astounding scientific practices than we have at our command now, however. These practices can be developed only through continued research. And we shall probably have to shift the proportions of productive agricultural land in some areas and adjust operations to land capabilities everywhere. Such land conversions present one of the major conservation problems of the next few decades, coupled with the dual problems of water conservation--correcting conditions of excess and shortage. In other words, with the prospect of tremendous competition for land and water, the conservation and development of resources must receive high priority in national policy in the coming century.

### Science As A Conservation Tool

Ever since crops were grown, man has constantly battled insects and other pests that attack his crops, his livestock, and himself. But since World War II, agriculture and the entire economy have benefited from a new arsenal of anti-pest weapons--the chemical pesticides. The increasing use of these chemicals has paralleled the upsurge in productivity on U.S. farms over the past decade, not to mention their value in saving forests and ranges from the ravages of insect pests.

Not only have pesticides contributed greatly to agricultural productivity by controlling crop and livestock pests, they have also increased man's own productivity--and his life span--by helping to eliminate or minimize the effects of pests that transmit human diseases.

A wide variety of chemicals is available today for safe use in all phases of food production, processing, and marketing. They include pesticides such as insecticides, weedkillers, fumigants, nematocides, and fungicides.

Pests still cost our agricultural economy more than \$13 billion a year--or nearly a third of the gross value of national farm production. The prosperity of agriculture and the welfare of consumers depends in large part on control of insects, plant diseases, weeds, and other pests.



Without pesticides, food quality as well as quantity would drop rapidly, while prices would climb. Many everyday foods would move into the luxury class. Producers of tomatoes and potatoes would lose every second or third crop. Commercial production of many of our common vegetables and fruits would not be possible on the scale we know today.

It would be hard indeed to get along without pesticides. In fact, if just three or four of our most important insecticides used for soil insects were banned, many of our important food crops would shortly become unavailable or unfit to eat. And yet we must use them with meticulous care. The same factors that measure the importance of these chemicals also indicate the responsibility of those who must use them to use them safely.

However, we do not rely solely on chemicals for pest control. Scientists have for many years devoted a substantial part of their pest-control efforts to biological control methods. Some insects kill other insects, and entomologists have long been working to turn the good ones against the bad ones, with some success.

About half the worst insect pests in the United States are foreigners. Hence, we have put considerable emphasis on biological control on the introduction and establishment of foreign predators and parasites to prey on the pest insects that have come into this country from abroad.

In recent years scientists have found also that insects lose their power to reproduce when they are bombarded by gamma rays from a radioactive cobalt source. If large enough numbers of sterile insects are released to overflow the natural populations, the ability of normal insects to propagate is affected. If this can be done over a period of time, the pest species can be eradicated.

In years past, eradication of pests seemed too hopeful. Scientists developed various controls, which were used with more and more frequency as agriculture became more intensive and pests were attracted in greater and greater numbers to crop areas to feed on plants and animals. As urban people became interested in



landscaping their newly acquired suburban homes, the uses of these controls became common until today, city and suburban dwellers--not farmers--constitute the most numerous users of chemical insecticides and other pesticides.

New techniques are being applied to battle insects that attack our food and fiber after it leaves the farm. Packaging, designed to repel insects, makes it possible to market many cereal products without heavy insect infestation. A DDT solution in the wash water can protect stored woolens from clothes moths and carpet beetles a full season.

Insects have not been the only pests with which man has been plagued for centuries. Weeds take nutrients and water from soil and may even compete with desirable plants for light, thus reducing both the quantity and quality of crops. In the United States, cotton producers can now save \$5 to \$10 per acre--plus half the man-hours once needed for hoeing--by using herbicides--chemical weedkillers--to control weeds. Losses in yield and quality in small grains have been reduced 13 to 20 percent since 1947 by the use of weed killers. At the same time, the cost of weed control in grains has been cut in half.

Some vegetable crops that once needed 100 to 200 man-hours of handweeding per acre can now be weeded with herbicides at less than one-tenth the cost.

In spite of such progress, pest control continues to be one of the most critical agricultural problems. In producing horticultural crops, for instance, mechanical methods of weed control are not always effective because of the closeness of weeds to crop plants so herbicides offer the most economical method at present. Biological control of weeds by insects is just starting--for example, the control of prickly pear cactus with cactus moth, and the control of Klamath weed with three introduced beetles.

Until new and better methods are devised, chemicals must play a major role in the control of pests in the immediate years ahead as they have in the past. There are problems and potential hazards growing out of the extensive use of some insecticides, and continued efforts to set up adequate safeguards must be emphasized.



## EDUCATION AND AGRICULTURE'S NEEDS

No major institution of society can disassociate itself from the past, least of all the educational institutions that have developed within America's agricultural society. The educational arm of the U.S. Department of Agriculture is made up of trained county agricultural and homemaking advisers, known as county agents and home demonstration agents. They have taken new knowledge to farmers, ranchers, marketing agencies and homemakers and 4-H youngsters by using every available means. Classrooms for these programs are the farms and homes of rural America. They are closely allied with research and the actual in-class curricula of the Colleges of Agriculture.

Academic studies of agriculture comprise a broad field, with fascinating new opportunities. Agriculture needs trained persons to process and distribute agriculture products, to give special services to people who actually produce these products, and to do further research and teaching that will make our agricultural production and distribution even more efficient than it is now.

### Agriculture Must Have More Scientists

Contrary to popular opinion, studying agriculture does not always mean that one is studying to become a farmer. Agriculture needs scientists. No animal nutritionist can learn too much chemistry; a good specialized animal breeder relies heavily on mathematics; a marketing specialist may need substantial training in economics; and a soils specialist must have a strong background in physics and bacteriology.

Actually, there are more than 500 distinct occupations in agriculture and farming itself is but one of them. Agriculture could employ 15,000 new college graduates each year. Our Land-Grant agricultural colleges graduate only about 7,000 young men and women each year in agricultural sciences--more than two possible futures for every graduate.



### Enrollments are Declining

Despite such a future, agricultural enrollments are declining. There are several reasons: other areas of education compete sharply for top students and the misconceptions about agriculture by the general public passed on to prospective students often lead to misinterpretations about agricultural education.

But these are problems agriculturalists have always contended with. Nowadays, the trend that causes them most concern is that there are fewer farm youth than ever taking agriculture--and they have been the traditional source of agricultural college students.

Agriculture must continue developing its technology. It will be counted on in the future to provide more for larger populations. As in recent years, the United States probably will continue to serve the agricultural development of the emerging nations. If only for these reasons, then, any planning and action toward educational improvement must take into consideration the need to acquaint the public with the purposes, needs, and contributions of agricultural education.

### PROBLEMS IN THE DEVELOPMENT OF HUMAN RESOURCES

Nearly a third of our people live in rural areas. More than half of our national poverty is found there. There are 4.1 million rural farm families with a total money income of less than \$2500 compared with 3.9 million such families in urban areas.

The concentration of poverty among farm families is even worse than among non-farm rural families. Almost half of our farm families had total money incomes from all sources of less than \$2500 in 1959, and nearly 2/3 of the individuals living alone on farms had incomes of less than \$1,000 a year.

### Land and People Inseparable

The process of change in American agriculture has left idle land and unused buildings on thousands of small tracts in low-income areas. These resources must



be directed to new uses. At the same time, they are so implicitly tied in with the human resources of the areas that any program must, essentially, take into account the conditions, hopes, and aspirations of the people left with the land.

#### Need for More Government Assistance

The Department of Agriculture, in cooperation with other agencies, is engaged in a determined effort to generate an expanding economic opportunity in rural areas. It is determined to remove the blight of rural poverty from our land within this generation. Additional tools, however, are needed for the job.

For instance, the most promising source, potentially, of new economic opportunities in many rural areas would be connected with outdoor recreation and tourism. Each additional factory, commercial enterprise, and public installation that locates in an area and builds a payroll provides the purchasing power base and need for additional enterprises, trade and service activity, and professional services. And those payrolls add still additional jobs and purchasing power in the area. Farmer cooperatives, for instance, have already shown what one good thriving business can mean to a community in added jobs and income for all.

Hand in hand with the improvement of human resources in these poverty stricken areas are programs for natural resources conservation. Watershed protection, water purification, improved rural roads and highways, sewage systems, recreational installations--all have a tendency to create closer ties between land and people.

As areas receive more opportunities, we should not and cannot delay strengthening educational and vocational training. Only highly skilled and well-trained young men and women are able to compete successfully in this technological age. There is no other single step that could be taken that would do more to improve the prospects of rural young people.



### Solutions Will Benefit All America

All of this benefits the city dweller. If we educate and provide opportunities in rural America, we relieve some of the problems of our urban areas.

The backbone of our rural economy is and will continue to be agriculture. The basic structure of agriculture in America is built on the family farm with its dependence on the operator family for much of its labor, capital, and management. The family farm system has helped to give this nation the strongest and most productive and most efficient agriculture in the world. For instance, U.S. farm production is about 60 percent higher than Russian farm production, and Russia employs six times as many people on farms. Today more than twice as many of our people are employed in marketing farm products as there are in growing them. They, too, are a part of "agriculture" in the most general and comprehensive sense of the word.

Any objective with respect to human resources must help all members of the agricultural industry to earn a living comparable to other economic groups. At the same time, part-time farming fits happily into the pattern for retired people or people with other incomes as they, too, are a vital part of our agricultural system.

### Many Programs Underway Already

Rural people aided by the Federal Government are moving to strengthen the economic foundations of rural communities and the family farm structure. Credit and other cost-sharing devices coupled with technical assistance in farm and financial management are being used by USDA to help rural people obtain the resources they need for survival. Funds are being advanced on a loan basis for better housing (with special provisions for housing the older people), for the development of rural community water systems, adjustments in farm operations, farm ownership, developing income-producing recreational enterprises, and shifts in the use of land.



As rural America is strengthened, the influx of unskilled labor into urban areas will slacken, the pressures that contribute to delinquency and build relief rolls in urban areas will decline. At the same time the rural market for urban produced goods and services will expand and the source of food and fiber so vital in national welfare will be strengthened.

Thus, the basic foundation of a prosperous rural area is the opportunity for employees in the agricultural industry and families on full-time and part-time family farms to have adequate incomes for their work, saving, and management. Such a program allows people to shape their own destinies in freedom and benefits our entire national purpose. America would have it no other way.





